

Assessing Impacts of MTBE on California Groundwater

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Report available at:

**<http://tsrtp.ucdavis.edu/mtberpt/>
<http://www.calepa.ca.gov/programs/MTBE/default.htm>**

Questions

- What are MTBE concentrations at LUFT sites?
- What is the impact on public supply wells?
- What are potential future impacts of MTBE plumes relative to benzene and alternative oxygenates?
- Do significant nonpoint-sources exist in cold regions like the Tahoe Basin?

Approach

- Compile statewide LUFT-site data from RWQCB records.
- Compile statewide public supply well data from DHS and Primacy Agencies for large and small water systems.
- Model MTBE and alternative oxygenate behaviors in typical aquifer settings.
- Sample snow and shallow groundwater in Tahoe Basin.

LUFT SITE DATA

General

- **32,779 petroleum sites.**
- **16,073 closed; 15,806 open.**
- **Of the 15,806, 8,019 sites are *groundwater-impacted* sites.**
- **Of the 8,019, 5,738 are gasoline tank sites.**
- **An estimated 250 additional sites will be discovered as part of the tank upgrade process.**

MTBE Detections at LUFT Sites

- **3,180 groundwater MTBE sites discovered thus far ($>0.5 - 20 \mu\text{g/L}$).**
- **Minimum of 55%¹ (3,180/5738) of gasoline tank sites have MTBE groundwater impacts.**
- **Much of remainder (45%) apparently due to incomplete MTBE testing, and tanks which leaked before MTBE use.**
- **For regions 1, 2, 4, & 5, 24% of gasoline sites tested were non-detects.**
- **% groundwater LUFT sites having groundwater impacts = 55 to 78%².**

MTBE IMPACTS ON PUBLIC & PRIVATE WATER SUPPLY WELLS

- **35 of 2,988 public drinking water wells that were tested reported MTBE detect.**
- **1.2% of all public supply wells that were tested.**
- **0.27% of all public supply wells in counties in which at least one well was tested.**
- **Total est. public supply wells currently with MTBE = 64 to 163.**
- **These public wells sometimes shut down before plumes hit.**
- **Est. private wells impacted: $\sim 10^3$.**

¹ Not all of the 5783 have been tested for MTBE.

² LLNL (1998).

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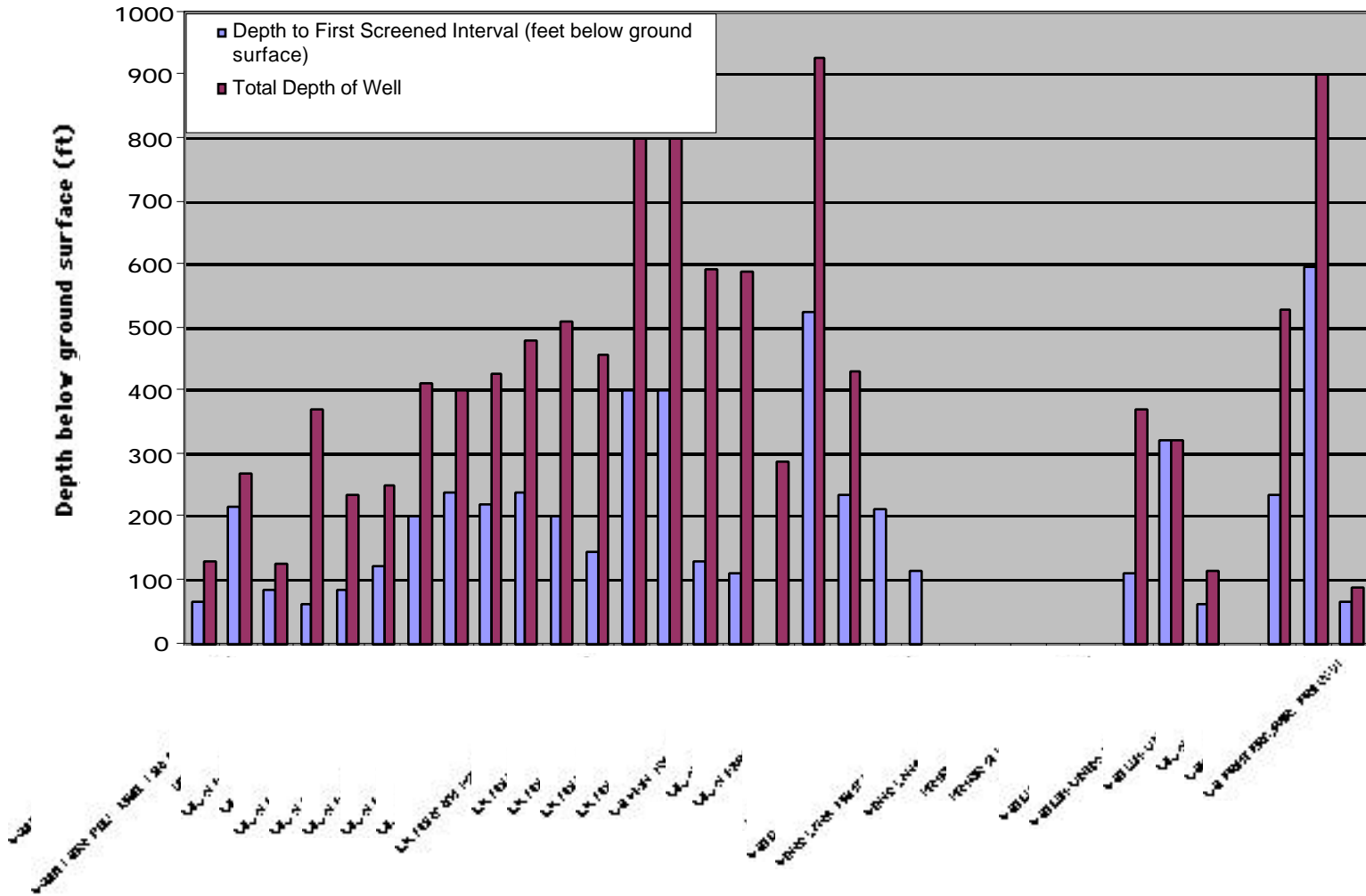
Sources?

- LUFT's, above-ground tanks, pipelines, surface spills, atmospheric sources.
- Most likely sources: LUFT's & atmospheric.
- Atmospheric sources unlikely to cause detects in most CA public supply wells.
 - Atm. C generally $<1 \mu\text{g/L}$.
 - Atm. contamination of groundwater will be shallow.
 - Most public supply wells tap substantial aquifer thicknesses – commonly deep below the water table.

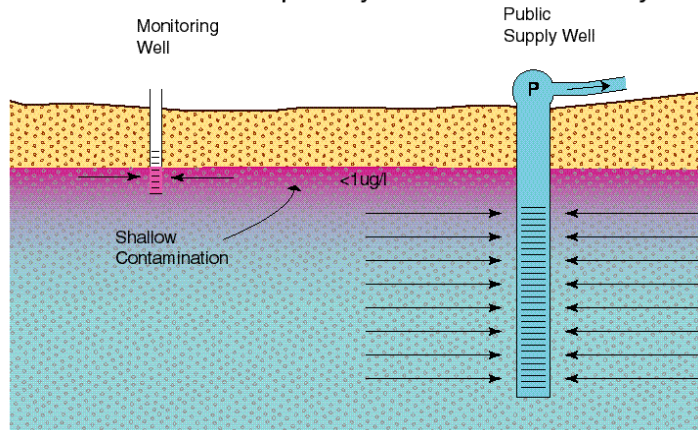
Most public well detects are due to LUFT sources and hence “detects” indicate substantial risk.

Testing Locations	Study Period	Average Concentration (ppb)	Maximum Airborn MTBE Concentration (ppb)	Calculated Equilibrium MTBE Concentration (µg/L) Partioned into Water ¹	Sampling Date
Burbank-West Palm Avenue	2 June 1996 - 28 May 1997	5.0	10	1.4000	28 January 1997
Chico-Manzanita Avenue	8 June 1996 - 16 April 1997	2.0	4.9	0.6860	17 December 1997
El Cajon-Redwood Avenue	2 June 1996 - 28 May 1997	2.2	6.6	0.9240	28 January 1997
Frenso-1st Street	8 June 1996 - 22 May 1997	2.3	8.1	1.1340	11 November 1996
Los Angeles-North Main Street	2 June 1996 - 28 May 1997	4.1	11.1	1.5540	4 December 1997
North Long Beach	2 June 1996 - 28 May 1997	3.4	8.6	1.2040	23 December 1997
Roseville-North Sunrise Blvd	8 June 1996 - 22 May 1997	1.1	2.8	0.3920	31 August 1996
¹ Dimensionless Henry's law coefficient = 0.0259 @ 25°C, Baehr et al. (1999) WRR 35(1).					

Screened intervals, PWS Wells w/ Detects



CA PWS Well Impact by Atm. Source Unlikely



Impacts in Tahoe Basin

- Low levels of MTBE contamination in Pope Marsh due to inflow from Lake.
- No detects in snow.
- 29 of 43 active gasoline LUFT sites have MTBE detects in groundwater.
- 67% of these have impacted or threaten surface water or groundwater.
- As of Sept. 1998, 11 STPUD public supply wells have been contaminated or threatened.
- Substantial lateral (>250 to >1,500 ft) and vertical migration of MTBE observed – as deep as 80 ft below water table.

Typical Alluvial Aquifer Heterogeneity, Western U.S. (fine-grained site)

